

CLAIMS

What is claimed is:

1 1. An apparatus for controlling the return path loss in a
2 two-way communication system, said apparatus comprising:

3 an input terminal and an output terminal;

4 forward path filter means, coupled to said input and
5 said output terminals, for passing signals in a forward path
6 frequency band of the communication system, said forward path
7 filter means including a resonant circuit component; and

8 return path filter means, coupled to said input and
9 said output terminals, for passing signals in a return path
10 frequency band of the communication system, said return path
11 filter means including a resonant circuit which is coupled to the
12 resonant circuit component of said forward path filter means,

13 a combined resonant circuit being formed, at least in
14 part, by the resonant circuit of said return path filter means
15 and the resonant circuit component of said forward path filter
16 means,

17 said return path filter means further including
18 attenuator means for attenuating the signals in the return path
19 frequency band as they pass through said return path filter
20 means.

1 2. The apparatus as recited in claim 1, wherein said
2 forward path filter means is a highpass filter which has a
3 passband containing the forward path frequency band of the
4 communication system.

1 3. The apparatus as recited in claim 1, wherein said
2 return path filter means is a lowpass filter which has a passband
3 containing the return path frequency band of the communication
4 system.

1 4. The apparatus as recited in claim 1, wherein the
2 attenuator means of said return path filter means is a resistive
3 network.

1 5. The apparatus as recited in claim 1, wherein the
2 combined resonant circuit forms a pole at a frequency below the
3 forward path frequency band.

1 6. The apparatus as recited in claim 1, wherein said
2 return path filter means has input and output resonant circuits,
3 and said attenuator means is coupled between the input and the
4 output resonant circuits.

1 7. The apparatus as recited in claim 1, wherein the
2 attenuation of said attenuator means is in the range of from
3 about 3 dB to about 35 dB.

1 8. The apparatus as recited in claim 1, wherein said
2 return path filter means attenuates signals in the forward path
3 frequency band, the attenuation in the forward path frequency
4 band having a frequency dependent component and a frequency
5 independent component, said frequency independent component being
6 supplied by the attenuation means.

1 9. The apparatus as recited in claim 1, wherein the
2 resonant circuit component of said forward path filter means is a
3 capacitor connected at one end to said input terminal, and the
4 resonant circuit of said return path filter means includes a
5 series capacitance and inductance circuit coupled between said
6 input terminal and ground.

1 10. The apparatus as recited in claim 1, further comprising
2 power bypass means, coupled to the attenuation means of said
3 return path filter means, for passing a power signal around the
4 attenuation means.

1 11. The apparatus as recited in claim 1, further comprising
2 equalization means, coupled to said return path filter means, for
3 altering the frequency response of said return path filter means
4 such that it substantially compensates for the frequency response
5 slope, in the return path frequency band, of a cable to which
6 said apparatus is to be coupled.

1 12. A passive filter for controlling the return path loss
2 in a communication system having a forward path and a return
3 path, said filter comprising:

4 a housing having an interior volume of less than about
5 5 cubic inches;

6 a first terminal and a second terminal;

7 a first passive filter network, mounted inside said
8 housing and coupled to said first and said second terminals and
9 to ground, said first filter network having a passband which

passes signals in the forward path of the communication system and a stop band which attenuates signals in the return path of the communication system;

a second passive filter network, mounted inside said housing and coupled to said first and said second terminals and to ground, said second filter network having a passband which passes signals in the return path of the communication system and a stop band which attenuates signals in the forward path of the communication system,

said second filter network further including a passive attenuator network which attenuates signals in the return path of the communication system as the signals pass through said second filter network.

13. The passive filter as recited in claim 12, wherein said first filter network is a highpass filter.

14. The passive filter as recited in claim 12, wherein said second filter network is a lowpass filter.

15. The passive filter as recited in claim 12, wherein the passive attenuator network is a resistive network.

16. The passive filter as recited in claim 12, wherein the attenuation of the passive attenuator network is substantially constant in the return path of the communication system, and is fixed in the range of from about 3 dB to about 35 dB.

1 17. The passive filter as recited in claim 12, further
2 comprising power bypass means, coupled to the passive attenuator
3 network, for passing a power signal around the attenuator
4 network.

1 18. The passive filter as recited in claim 12, further
2 comprising equalization means, coupled to said second filter
3 network, for altering the frequency response of said second
4 filter means such that it substantially compensates, at least in
5 the return path, for the frequency response slope of a cable
6 channel to which said passive filter is to be coupled.

1 19. The passive filter as recited in claim 12, wherein said
2 housing has a tubular shape with a length not exceeding about 80
3 mm and a diameter not exceeding about 25 mm.

1 20. The passive filter as recited in claim 12, wherein said
2 first and said second filter networks each include an inductor
3 and a capacitor, the inductors and capacitors being fixed-value
4 components.

1 21. The passive filter as recited in claim 20, wherein at
2 least one of the inductors is a ferrite core inductor.

1 22. The passive filter as recited in claim 21, wherein the
2 effective inductance of said at least one ferrite core inductor
3 is dependent upon its position relative to at least one other
4 inductor in the passive filter.

1 23. The passive filter as recited in claim 22, wherein the
2 effective inductance of said at least one ferrite core inductor
3 is further dependent upon its position relative to said housing.

1 24. The passive filter as recited in claim 22, wherein the
2 effective inductance of said at least one ferrite core inductor
3 is less than the specified inductance for said inductor.

1 25. A method of tuning the passive filter of claim 22,
2 wherein an inductance value of said at least one ferrite core
3 inductor has been determined for the filter network in which said
4 inductor is to operate, said method comprising step of:

5 adjusting the position of said at least one ferrite
6 core inductor in said passive filter until the effective
7 inductance of said at least one ferrite core inductor is
8 substantially equal to said determined inductance value.

9 26. A method of making the passive filter of claim 22,
10 comprising the steps of:

11 (a) selecting capacitance values for the capacitors of the
passive filter;

 (b) determining an inductance value for said at least one
ferrite core inductor based on at least one of the capacitance
values selected in step (a);

 (c) selecting a specified inductance for said at least one
ferrite core inductor that is greater than the inductance value
determined in step (b);

 (d) assembling the passive filter; and

12 (e) adjusting the position of said at least one ferrite
 13 inductor in said passive filter until the effective inductance of
 14 said at least one ferrite inductor is substantially equal to the
 15 inductance value determined in step (b).

1 27. The method of claim 26, wherein said step (a) includes
 2 selecting standard capacitance values for the capacitors of the
 3 passive filter.

1 28. The method of claim 26, wherein said step (c) includes
 2 selecting a specified inductance for said at least one ferrite
 3 core inductor that is from about 10% to about 15% greater than
 4 the inductance value determined in step (b).

1 29. An apparatus for controlling the return path loss in a
 2 communication system having a forward path and a return path,
 3 said apparatus comprising:

4 a windowed highpass filter having a highpass passband
 5 which passes signals in the forward path and a bandpass passband
 6 or window which passes signals in the return path; and

7 attenuator means, coupled to said windowed highpass
 8 filter, for attenuating the window of said windowed highpass
 9 filter by a predetermined amount, such that the signals passing
 10 through the window are attenuated thereby.

1 30. The apparatus as recited in claim 29, wherein the
 2 communication system is a cable television system having a
 3 headend and a subscriber end, the signals in the forward path

4 being RF television programming signals transmitted from the
5 headend, and the signals in the return path being signals
6 transmitted from the subscriber end.

1 31. The apparatus as recited in claim 29, wherein said
2 attenuator means includes at least one resistor.

1 32. The apparatus as recited in claim 29, wherein the
2 window of said windowed highpass filter is realized from a
3 network of capacitors and inductors, and said attenuator means
4 includes at least one resistor connected across one of the
5 capacitors.

1 33. The apparatus as recited in claim 29, wherein the
2 window of said windowed highpass filter is realized from a
3 network of capacitors and inductors, and said attenuator means
4 includes a plurality of resistors connected across a
5 corresponding plurality of the capacitors, respectively, of said
6 windowed highpass filter.

1 34. The apparatus as recited in claim 29, wherein the
2 predetermined amount of attenuation of said attenuator means is
3 substantially constant in the return path frequency band and is
4 fixed in the range of from about 6 dB to about 12 dB.

1 35. A method of controlling the return path loss in a
2 communication system having a forward path and a return path,
3 said method comprising the steps of:

4 (a) passing signals in the forward path of the
5 communication system through a highpass filter passband;

6 (b) passing signals in the return path of the communication
7 system through a bandpass filter passband or window; and

8 (c) attenuating the window by a predetermined amount such
9 that the signals passing through the window are attenuated
10 thereby.

11 36. The method as recited in 35, wherein the communication
12 system is a cable television system having a headend and a
13 subscriber end, and wherein

14 said step (a) includes passing RF television
15 programming signals transmitted from the headend through said
16 highpass filter passband; and

17 said step (b) includes passing signals transmitted from
18 the subscriber end through said window.

1 37. The method as recited in 35, wherein said step (c)
2 includes attenuating the window by 6 dB.

1 38. The method as recited in 35, wherein said step (c)
2 includes attenuating the window by 12 dB.

1 39. A passive filter for controlling the return path loss
2 in a communication system having a forward path and a return
3 path, said passive filter comprising:

4 a housing having an interior volume of less than about
5 5 cubic inches;

6 a first terminal and a second terminal;

7 a passive filter network, mounted inside said housing
8 and coupled to said first and said second terminals and to
9 ground, said filter network having a first passband which passes
10 signals in the forward path and a second passband which passes
11 signals in the return path, said filter network including

12 a passive attenuator circuit, associated with the
13 second passband, which attenuates signals in the return path by a
14 predetermined amount as the signals pass through the second
15 passband of said filter network.

1 40. The passive filter as recited in claim 39, wherein said
2 passive filter network is a windowed highpass filter.

1 41. The passive filter as recited in claim 39, wherein said
2 passive filter network is a duplex filter.

1 42. The passive filter as recited in claim 39, wherein the
2 communication system is a cable television system having a
3 headend and a subscriber end, the signals in the forward path
4 being RF television program signals transmitted from the headend,
5 and the signals in the return path being signals transmitted from
6 the subscriber end.